FRESENIUS

2008K

Debug Screens

Functional Software
v3.12 – v3.17

Part Number 490075 Rev C

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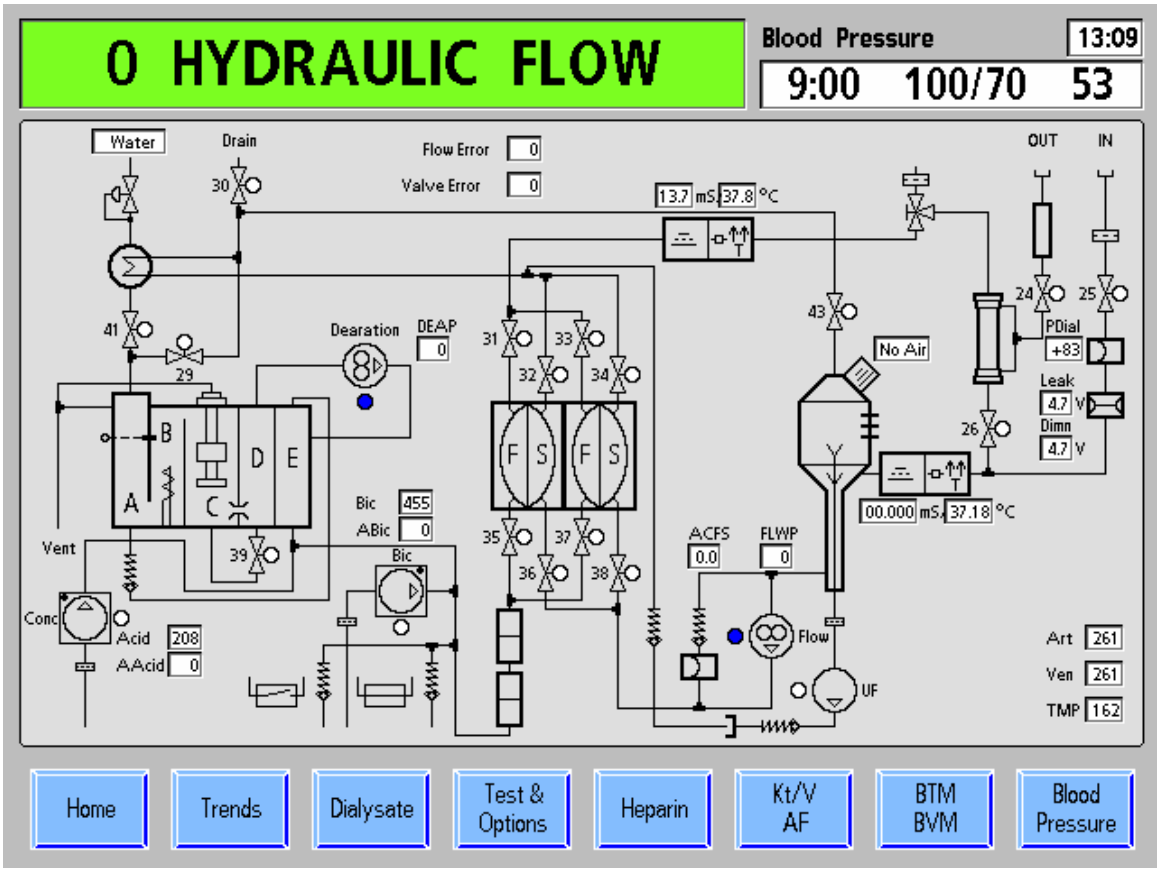
Accessing Debug Screens

The Debug Screens can be accessed in both Dialysis mode and Rinse Mode by pressing and holding the up and down arrow keypads at the same time. Use the up and down keypads individually to scroll through each Debug Screen.

DEBUG SCREEN 0 - HYDRAULIC FLOW



Note: This screen will be different if Online Clearance (OLC) or Diasafe is not installed.

ACID

The number of acid pump steps (per stroke) sent to the actuator board from the functional board. The actuator board will step the acid pump motor this many steps away from the end of stroke sensor. This value is determined by the currently selected concentrate and should make the acid pump deliver APV.

AACID

The actual number of acid pump steps sent to the acid pump by the actuator board. The actuator board will step the acid pump motor until the end of stroke is sensed. AACI is the number of steps counted until this end of stroke. If AACI does not equal ACID, an EOS error will be generated.

BIC

The number of bicarbonate pump steps (per stroke) sent to the actuator board from the functional board. The actuator board will step the acid pump motor this many steps away from the end of stroke sensor. This value is determined by the currently selected concentrate and should make the bicarbonate pump deliver BPV.

ABIC

The actual number of bicarbonate pump steps sent to the bicarbonate pump by the actuator board. The actuator board will step the bicarbonate pump motor until the end of stroke is sensed. ABIC is the number of steps counted until this end of stroke. If ABIC does not equal BIC, an EOS error will be generated.

AIR / NO AIR

Air sensed in air separation chamber 69 = 1.

WATER/NO WATER

Indicates a water alarm.

FLOW ERROR

Indicates the presence of a flow error. 1 = Flow Error.

VALVE ERROR

Indicates the presence of a valve error. 1 = Valve Error.

ART

Displays the arterial pressure.

VEN

Displays the venous pressure.

TMP

Displays the TMP.

PDIAL

Displays the dialysate pressure.

CONDUCTIVITY CELL & TEMPERATURE

Displays the conductivity and temperature at each conductivity cell.

LEAK

Displays the voltage of the blood leak detector.

DIMN

Displays the voltage of the dimness channel of the blood leak detector.

FLWP

Displays the flow pump DAC value. 255 minus this value = DAC value sent to flow pump from the actuator board.

DEAP

Displays the deaeration pump DAC value. 255 minus this value = DAC value sent to deaeration pump from the actuator board.

ACFS

Chamber full switch Actuator board A/D value.

UF PULSE INDICATOR

This displays the UF pump strokes. The indicator turns blue as the UF pump strokes. Also, if the UF pump solenoid goes to a high resistance state this pin goes high (1) constantly causing the functional board to issue a UF PUMP ALARM.

FLOW PUMP INDICATOR

This displays the flow pump status. The indicator turns blue when the flow pump turns on.

DEAERATION PUMP INDICATOR

This displays the deaeration pump status. The indicator turns blue when the flow pump turns on.

CONCENTRATE PUMP INDICATOR

This displays the concentrate pump strokes. The indicator turns blue as the concentrate pump strokes.

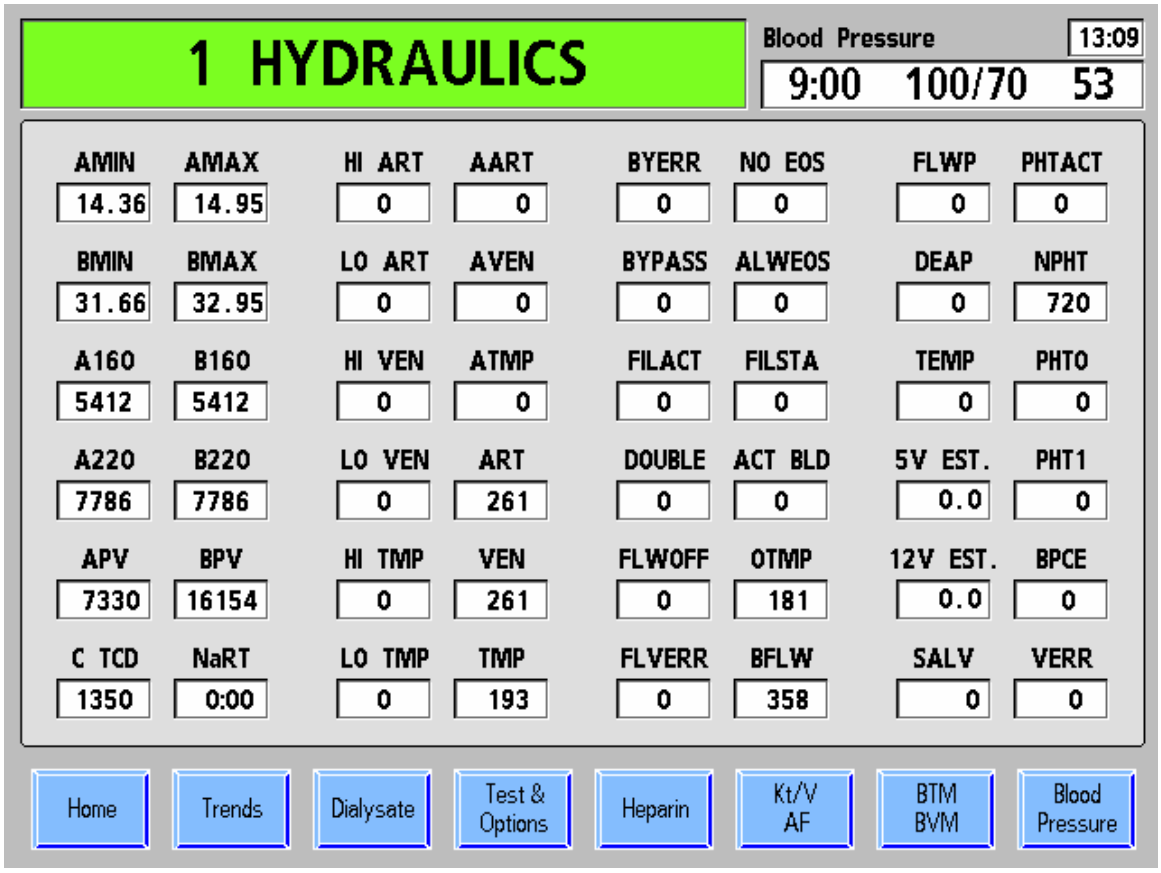
BICARBONATE PUMP INDICATOR

This displays the bicarbonate pump strokes. The indicator turns blue as the bicarbonate pump strokes.

VALVE INDICATORS

This displays each valves status. The indicator turns blue when the valve turns on.

DEBUG SCREEN 1 - HYDRAULICS



AMIN

The minimum allowed volume delivered from a calibrated acid pump based upon the current machine settings. This value is used in the preventative maintenance procedure.

AMAX

The maximum allowed volume delivered from a calibrated acid pump based upon the current machine settings. This value is used in the preventative maintenance procedure.

BMIN

The minimum allowed volume delivered from a calibrated bicarbonate pump based upon the current machine settings. This value is used in the preventative maintenance procedure.

BMAX

The maximum allowed volume delivered from a calibrated bicarbonate pump based upon the current machine settings. This value is used in the preventative maintenance procedure.

A160

Stroke volume of the acid pump at 160 steps. This volume was determined and put into the EEPROM during acid pump calibrations.

Example: 8620 = 0.8620 ml/stroke

B160

Stroke volume of the bicarbonate pump at 160 steps. This volume was determined and put into the EEPROM during bicarbonate pump calibrations.

Example: 8620 = 0.8620 ml/stroke

A220

Stroke volume of the acid pump at 220 steps. This volume was determined and put into the EEPROM during acid pump calibrations.

Example: 8620 = 0.8620 ml/stroke

B220

Stroke volume of the bicarbonate pump at 220 steps. This volume was determined and put into the EEPROM during bicarbonate pump calibrations.

Example: 8620 = 0.8620 ml/stroke

APV

Current acid pump stroke volume based on ACID.

Example: 8620 = 0.8620 ml/stroke

BPV

Current bicarbonate pump stroke volume based on BIC.

Example: 8620 = 0.8620 ml/stroke

C TCD

Calculated theoretical conductivity based on Na+, bicarbonate, and concentrate selected.

NaRT

Remaining time in a sodium variation program (SVS). This value will be 0:00 if no program is running.

HI ART

Hardware high arterial alarm (actuator).

AART

Calculated arterial pressure by the actuator board to within 1 mmHg.

LO ART

Hardware low arterial alarm (actuator).

AVEN

Calculated venous pressure by the actuator board to within 1 mmHg.

HI VEN

Hardware high venous alarm (actuator).

ATMP

Calculated TMP by the actuator board to within 1 mmHg.

LO VEN

Hardware low venous alarm (actuator).

ART

Functional board precise arterial pressure to within 1 mmHg.

HI TMP

Hardware high TMP alarm (actuator).

VEN

Functional board precise venous pressure to within 1 mmHg.

LO TMP

Hardware low TMP alarm (actuator).

TMP

Functional board precise TMP to within 1 mmHg.

BYERR

Bypass valve error. 1 = Yes / 0 = No / Not used.

NO EOS

No EOS (End Of Stroke) from the acid or bicarbonate pump.

Note: Each concentrate pump has two optical sensors. These sensors monitor the EOS or the point where the volume of the diaphragm pump is completely pressed out. The pump steps away from this EOS by the number of steps defined in ACID or BIC. The pump steps toward the EOS until the EOS is sensed. The number of steps that are counted is AACI or ABIC. The number of steps toward the EOS should equal the number of steps away from the EOS i.e. ACID = AACI or BIC = ABIC. If there is a discrepancy between steps sent and steps used an EOS error will be issued by the actuator board. NO EOS means that the AACI or ABIC number is equal or greater than 500.

1 = Yes / 0 = No

BYPASS

Bypass is active. The machine goes into bypass when we get a temperature or conductivity alarm.

1 = Yes / 0 = Not Used

ALWEOS

Always EOS (End Of Stroke) from the acid or bicarbonate pump.

Note: Each concentrate pump has two optical sensors. These sensors monitor the EOS or the point where the volume of the diaphragm pump is completely pressed out. The pump steps away from this EOS by the number of steps defined in ACID or BIC. The pump steps toward the EOS until the EOS is sensed. The number of steps that are counted is AACI or ABIC. The number of steps toward the EOS should equal the number of steps away from the EOS i.e. ACID = AACI or BIC = ABIC. If there is a discrepancy between steps sent and steps used an EOS error will be issued by the actuator board. NO EOS means that the AACI or ABIC number is equal or greater ALWEOS means that the AACI or ABIC number is less than 100 steps.

1 = Yes / 2 = No

FILACT

Fill program is active.

1 = Yes / 0 = No

FILSTA

Fill program has started.

1 = Yes / 0 = No

DOUBLE

Bicarbonate pump double stroke = 1.

If more than 300 steps are needed to produce 1ml, the bicarbonate pump will double stroke.

ACT BLD

Blood sensed in the optical detector by the actuator.

1 = Yes / 0 = No

FLWOFF

Flow is off.

1 = Yes / 0 = No

OTMP

Raw TMP value without taking blood or dialysate flow into account.

FLVERR

Flow valve error.

1 = Yes / 0 = No / Not used

BFLW

Current Blood Flow Rate in ml/min.

FLWP

Displays the flow pump DAC value. 255 minus this value = DAC value sent to flow pump from the actuator board.

PHTACT

On-line pressure holding test is enabled.

1 = Option ON / 0 = Option OFF

DEAP

Displays the deaeration pump DAC value. 255 minus this value = DAC value sent to deaeration pump from the actuator board.

NPHT

Seconds until next on-line pressure holding test.

TEMP

Calculated temperature.

Example 370 = 37.0°C

PHT0
Result of PHT first valve combination.

5V EST.
Estimated 5V from the power supply.

PHT1
Results of PHT second valve combination.

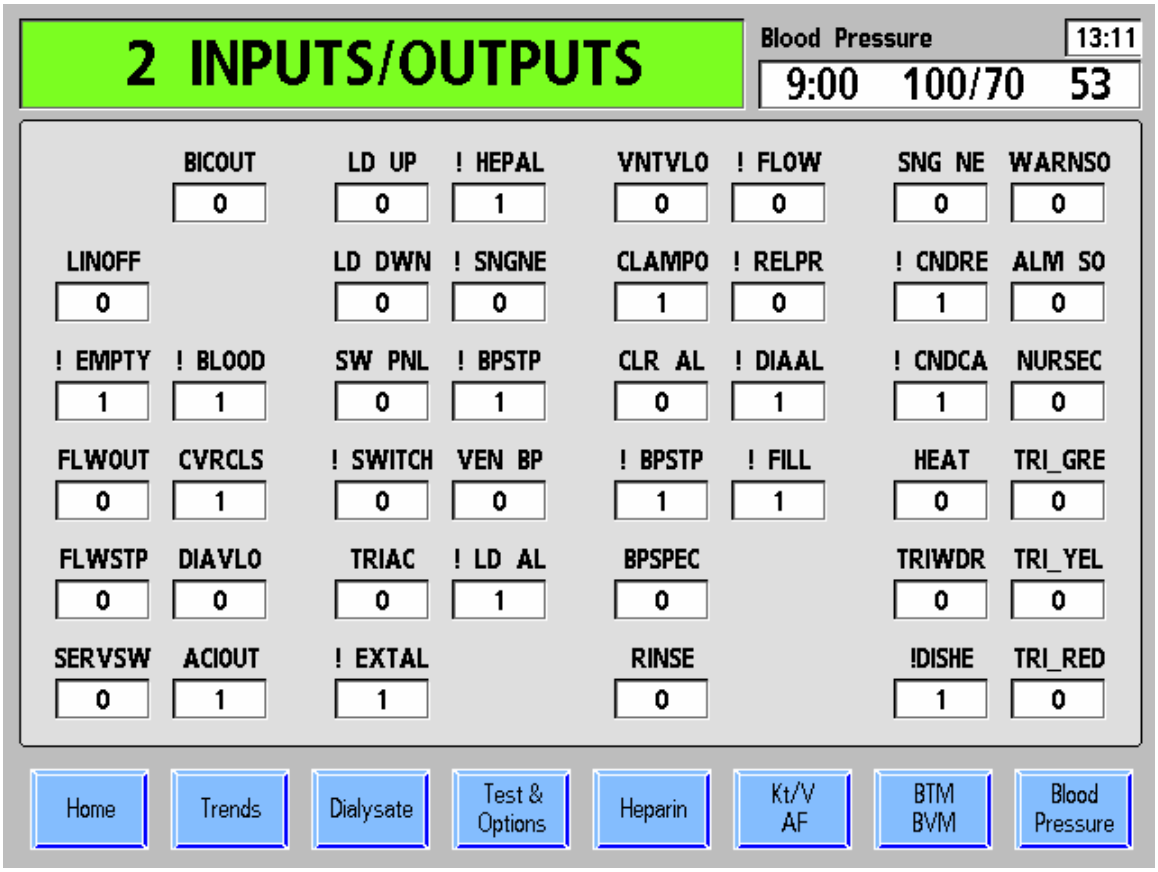
12V EST.
Estimated 12V from the power supply.

BPCE
Blood pump communication errors. This is a number of how many errors have occurred.

SALV
Saline volume. Not used.

VERR
Valve error.
A valve error will cause this number to count up.
No valve error = 0

DEBUG SCREEN 2 - INPUTS / OUTPUTS



LINOFF

Lines off. This pin = 1 if both the red and the blue dialysate connectors are out of the shunt. Both dialysate lines must be in the shunt (LINOFF = 0) to start the cleaning modes.

! EMPTY

No empty. This pin = 0 if the red dialysate line is out of the shunt and the blue connector is in the shunt. This configuration enables the "Emptying Program" causing all spent side of the balancing chamber to close while the flow pump runs. This "Empties" the dialyzer of dialysate.

FLWOUT

This pin is directly from balancing chamber valve 33 and toggles from 1 to 0 as the balancing chamber valves cycle. 1 = valve 33 open.

FLWSTP

Flow stopped. This pin = 1 when flow stops for any reason. All balancing chamber valves are off during flow stop.

SERVSW

Service switch. In non-service mode = 0.

Note: The service switch is located on the back panel

BICOUT

Bicarbonate connector out. Bicarbonate connector not plugged into machine = 1 (reed switch K12 in the "open" state).

! BLOOD

No Blood. Blood sensed in the optical detector = 0.

CVRCLS

Shunt door closed. Shunt door closed = 1.

DIAVLO

Dialyze valve 24 open. Valve 24 open = 1 i.e. machine is not in bypass. This pin must = 0 if a bypass alarm becomes present.

ACIOUT

Acid connector out. Acid connector not plugged into machine = 1 (reed switch K11 in the "open" state).

LD UP

Level detector switch up. Venous chamber level up switch pressed = 1. The level adjust switch is used to raise the level in the venous drip chamber.

LD DWN

This pin is always = 0 (unused).

SW PNL

This pin is always = 1.

! SWITCH

Power button not pushed. Pushed = 0.

TRIAC

If the triac is this pin = 0. In the first 10 seconds, after entering dialysis mode, the heater relay (RL 3) is turned off so that no voltage is available to the triac while the temperature control circuit, on the sensor board, is fully on. This pin should be = 1 since there is no voltage available to the triac. If the pin goes low (TRIAC = 0) during this time a “HEATER RELAY TEST FAIL” will be issued by the functional board. Pin A10 on the motherboard connector P1.

! EXTAL

Unused.

! HEPAL

No heparin pump alarm. No alarm = 1.

! SNGNE

Single needle (venous) blood pump not running. Venous blood pump running = 0. During single needle operation, when the arterial blood pump runs, the venous blood pump does not and vise versa. This pin monitors the blood pump during so that the functional board can control the venous clamp. When the arterial blood pump runs, in single needle operation, the venous clamp is closed.

! BPSTP

No blood pump(s) stopped alarm. Blood pump (arterial or venous) stopped alarm = 0 (low). If the blood pump(s) are turned on this pin will = 0 15 or 30 seconds after the blood pump(s) stopped stop for any reason.

VEN BP

Operational venous (single needle) blood pump present. Pump present = 1. This pin must = 1 in order to turn single needle function on.

! LD AL

No level detector alarm. No level detector alarm = 1.

VNTVLO

Vent valve open. Open vent valve in self prime = 1. The vent valve is located inside the level detector module and vents the venous drip chamber to atmosphere when open. This pin does not go high when manually raising the venous level.

CLAMPO

Venous bloodline clamp open. Open clamp = 1.

CLR AL

Clear alarms. Reset alarms to modules = 1.

Note: This occurs too quickly to be seen in DEBUG.

! BPSTP

No blood pump stopped. Stop blood pump(s) = 0.

BPSPEC

Blood pump special. Special blood pump control = 1. This pin inputs the blood pump module and controls the blood pump to a maximum speed of 150 ml/min. This occurs whenever the venous level switch is held up to raise the venous drip chamber level.

RINSE
In rinse. In rinse program = 1.

! FLOW
No flow. Flow off = 1 with no water alarm.

! RELPR
No release pressure. Release dialysate pressure = 0. This occurs when resetting a TMP alarm.

! DIAAL
No dialysate alarms. Dialysate alarms = conductivity or temperature alarm or shunt door open = machine in bypass = 0 (i.e. valve 24 closed, valve 26 open).

! FILL
No fill. Not in fill program = 1.

SNG NE
Single needle. Turn single needle on = 1.

! CNDRE
No conductivity resistor. Normally = 1. During conductivity cell calibrations the functional board takes this pin low (! CNDRE= 0) and turns on the sensor board relay (RL2). This puts a fixed resistor (R6) into the sensor board conductivity counter circuit.

! CNDCA
No conductivity calibration. Normally = 1. During conductivity cell calibrations the functional board takes this pin low (!CNDCA = 0) and turns on the sensor board relay

(RL1). This removes the conductivity cell from the conductivity counting circuit.

HEAT
Heat relay on. On = 1. The heater relay (RL3), located in the power supply on the power control board, supplies 120 Vac to the triac. The functional board keeps RL3 on as long as temperature remains below 41.5ºC in dialyze mode or 90ºC in heat disinfect.

TRIWDR
Triac watchdog reset. Normally = 0. During power up the functional board tests the heater relay (RL 3), located in the upper power supply on the power control board, for proper function.
Reset = 1.

! DISHE
No heat disinfect. Machine in heat disinfect = 0. Generates high temperature for heat disinfect.

WARNSO
Warning sound on. Sound on = 1.

ALM SO
Alarm sound on. Sound on = 1.

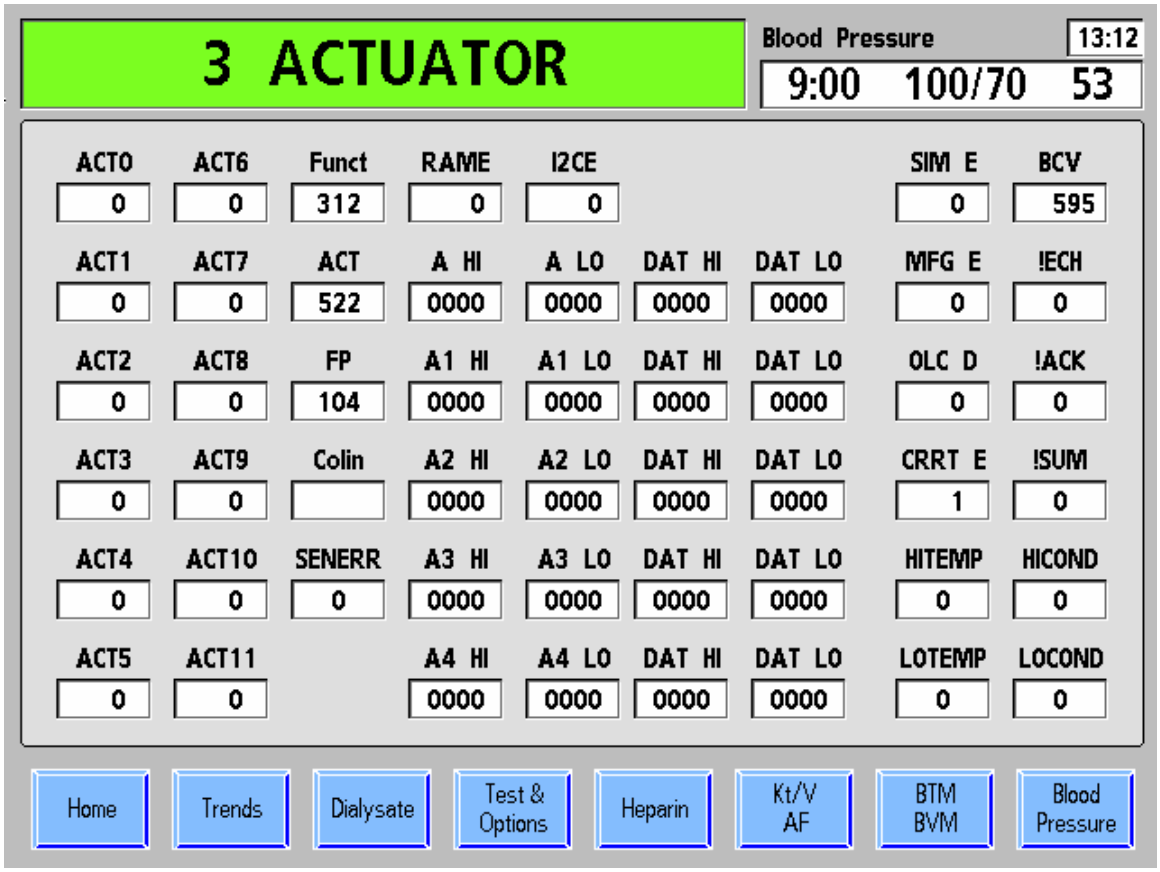
NURSEC
Nurse call on. ON = 1.

TRI_GRE
Green traffic light on. Green traffic light on = 1. Traffic lights are optional and hang on the IV pole. Since they hang on the IV pole they can be seen from across the unit.

TRI_YEL
Yellow traffic light on. Yellow traffic light on = 1.

TRI_RED
Red traffic light on. Red traffic light on = 1.

DEBUG SCREEN 3 - ACTUATOR



USED FOR ARBITRARY SOFTWARE DEBUGGING.

ACT0	ACT1	ACT2
ACT3	ACT4	ACT5
ACT6	ACT7	ACT8
ACT9	ACT10	ACT11

Funct

Displays the functional software version without a decimal (312 = v3.12)

ACT

Displays the actuator software version without a decimal (522 = v5.22)

FP

Displays the front panel software version without a decimal (104 = v1.04)

Colin
For Future Use.

SENERR
The status of communication errors with the sensor board.

RAME
This is the number of errors in the comparison of RAM to Flash since the machine was turned on.

I2CE
This is the total number of comparison errors in when the I2C is read at power up.

A (A1-A2-A3-A4) HI & A (A1-A2-A3-A4) LO
These are the addresses of the last 5 RAM/Flash comparison errors.

DAT? HI
This is the total number of comparison errors since the board was initialized.

DAT? LO
Unused.

SIM E
Special Idle Mode for DSD enable.

MFG E
Special options for DSD enable.

OLC D
OLC disabled.

CRRT E
CRRT enabled.

BCV
Actual balancing chamber volume as per two strokes.
Example: 609 = 60.9 ml

!ECH
Number of times no echo signal was received. This is a communication signal between actuator board and functional board.

!ACK
Number of times no acknowledge signal was received. This is a communication signal between actuator board and functional board.

!SUM

Number of bad check sums. This is a communication signal between actuator board and functional board.

HITEMP/LOTEMP

This is the temperature alarm status from the actuator board.

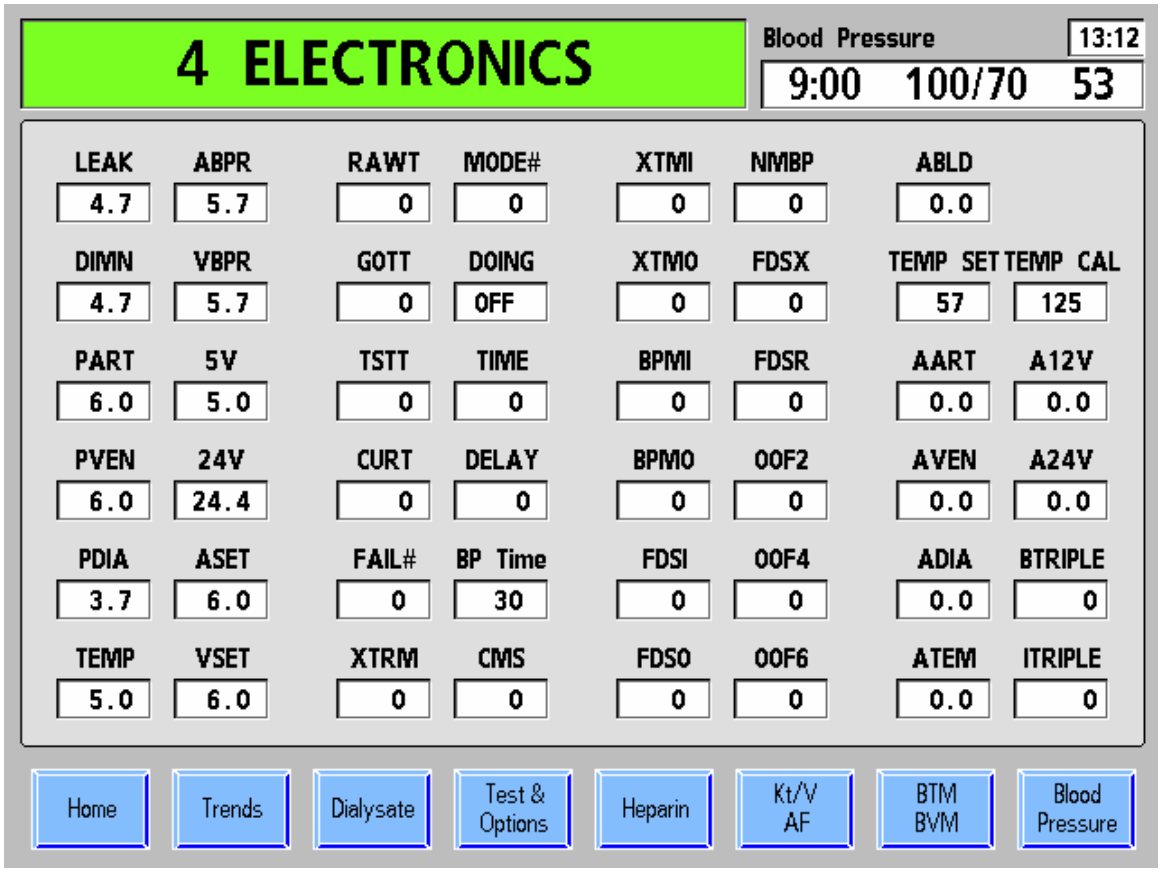
Above or below 30- 41

HICOND/LOCOND

This is the conductivity alarm status from the actuator board.

Above or below 12.5 – 16.0

DEBUG SCREEN 4 - ELECTRONICS



LEAK
Blood leak receiver (in Vdc). Sensor board ADC input channel 0.

DIMN
Blood leak dimness receiver (in Vdc). Sensor board ADC input channel 1.

PART
Arterial pressure (in Vdc). Sensor board ADC input channel 2.

PVEN
Venous pressure (in Vdc). Sensor board ADC input channel 3.

PDIA
Dialysate pressure (in Vdc). Sensor board ADC input channel 4.

TEMP
Temperature monitor NTC3 (in Vdc). Sensor board ADC input channel 5.

ABPR
Arterial blood pump rate (in Vdc). Sensor board ADC input channel 6.

VBPR
Venous (single needle) blood pump rate (in Vdc). Sensor board ADC input channel 7.

5V
5V power supply (in Vdc). Sensor board ADC input channel 8.

24V
24V power supply (in Vdc). Sensor board ADC input channel 9.

ASET
Arterial blood pump set (in Vdc). Sensor board ADC input channel 10.

VSET
Venous (single needle) blood pump set (in Vdc). Sensor board ADC input channel 11.

SELF-TEST SIGNALS

RAWT:	Raw TMP.
MODE#:	Test Mode.
GOTT:	Achieved Dialysate Pressure in Pressure Holding Test.
DOING:	Type of Test.
TSTT:	Test TMP.
TIME:	Test Timeout.
CURT:	Current TMP.
DELAY:	Stabilization Time Delay.
FAIL#:	Number of Self Test Failures.

XTRM
Last byte received from Transterm (actuator board).

BPTIME
Count down timer for Blood Pressure interval.

CMS
Undefined.

NMBP
Number of blood pressure measurements sent to FDS08 since last New Tx key press or long power down.

FUNCTIONAL BOARD COMMUNICATION DATA USED IN SOFTWARE DEVELOPMENT

XTMI: Not Used.
XTMO: Not Used.
BPMI: Not Used.
BPMO: Not Used.
FDSI: Not Used.
FDSO: Not Used.
FDSX: FDS08 Option Set ON or OFF.
FDSR: Interval Time (seconds) for Sending Data to FDS08.
00F2: Not Used.
00F4: Not Used.
00F6: Not Used.

TEMP SET

DAC value for calibration.

TEMP CAL

DAC value for calibration.

ACTUATOR BOARD VALUES

ABLD: Blood Leak Detector.
AART: Arterial Pressure.
AVEN: Venous Pressure.
ADIA: Dialysate Pressure.
ATEM: Temperature.
A12V: 12 Volt Supply.
A24V: 24 Volt Supply.

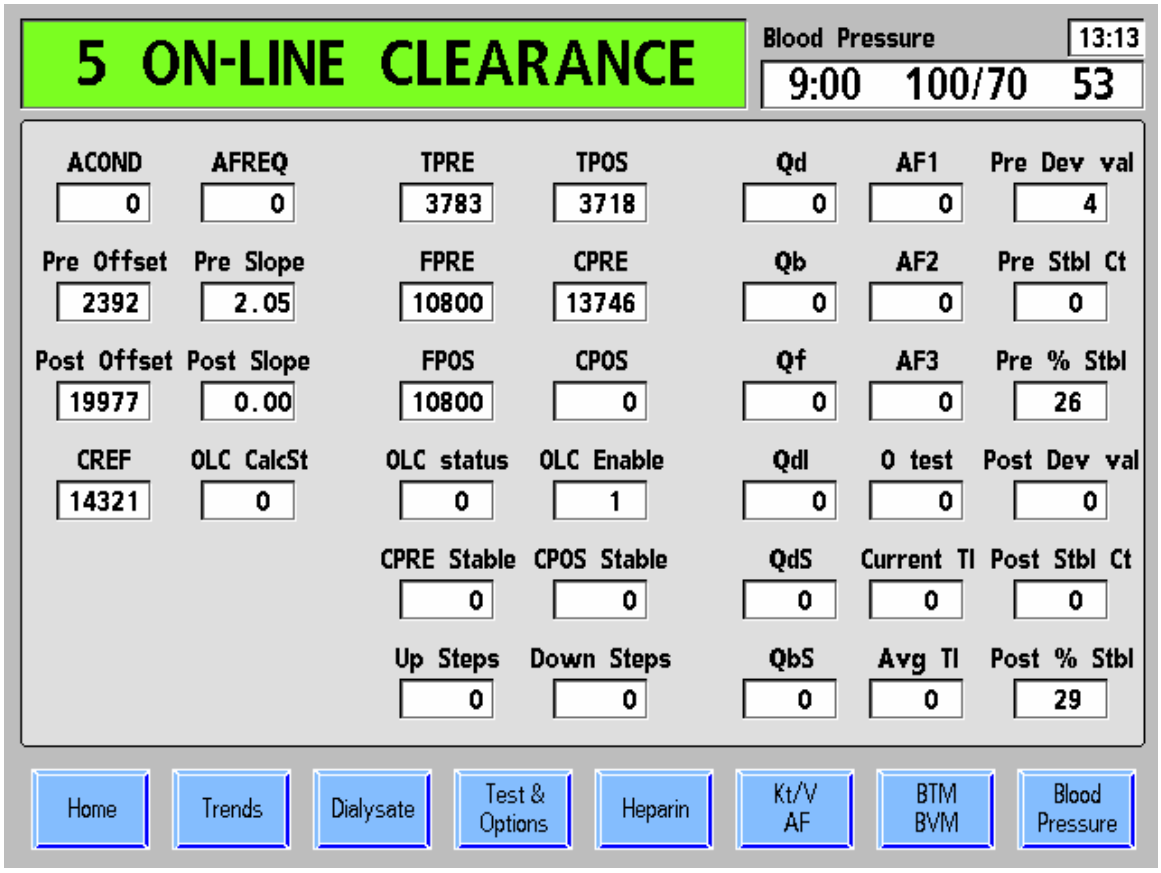
BTRIPLE

Number of failure locations of battery RAM triple check.

ITRIPLE

Number of failure locations of I2C triple check.

DEBUG SCREEN 5 - ON-LINE CLEARANCE



ACOND

Conductivity derived through the actuator board.

AFREQ

The frequency measured by the actuator board which corresponds to non-temperature compensated conductivity.

Pre Offset

Pre offset value used in the calculation of conductivity.

Condo = slope * frequency + offset

Example: 2394 = 2.394

Pre Slope

Pre slope criteria for conductivity calculation.

Condo = slope * frequency + offset

Example: 2026 = 2.026

Post Offset

Pre offset value used in the calculation of conductivity.

Condo = slope * frequency + offset

Example: 2394 = 2.394

Post Slope

Post slope criteria for conductivity calculation.

Condo = slope * frequency + offset

Example: 2026 = 2.026

CREF

Frequency measurement of the reference resistor done during conductivity calibration.

OLC CalcSt

This parameter indicates if the calculation for the steps is complete. 6 if complete, 0 if in process.

TPRE

Temperature pre-dialyzer.

Example: 3710 = 37.10ºC

TPOS

Temperature post-dialyzer.

Example: 3710 = 37.10ºC

FPRE

Frequency pre-dialyzer. This value is used in calculating pre-dialyzer conductivity.

Note: Frequency is read as cycles per second, but this value is read as cycles per 2 seconds or twice the frequency

Example: 11290 = 5645 hertz

CPRE

Conductivity pre-dialyzer.

Example: 14184 = 14.184 mS

FPOS

Offset Frequency post-dialyzer. This value is used in calculating post-dialyzer conductivity, but is offset so it does not interfere with the CPRE frequency.

Note: Frequency is read as cycles per second, but this value is read as cycles per 2 seconds or twice the frequency

Example: 14290 = 7145 hertz

CPOS

Conductivity post-dialyzer.

Example: 14184 = 14.184 mS

OLC status

The status of on-line clearance.

1 = top point of conductivity

2 = bottom point of conductivity

0 = not running

OLC Enable

The status of the OLC Enable/Disable codes in EEPROM memory.

Cpre Stable

Conductivity value of pre-dialyzer sensor when it stabilizes.
Example: 15800 = 15.800 mS, this is the pre-conductivity value used in calculating KEU

CPOS Stable

Conductivity value of post-dialyzer sensor when it stabilizes.
Example: 15466 = 15.466 mS, this is the post-conductivity value used in calculating KEU

Up Steps

The calculated acid pump step rate for the upper OLC level.

Down Steps

The calculated acid pump step rate for the lower OLC level.

Qd

Actual dialysate flow during on-line clearance. Taken when pre and post conductivity is at upper and lower point of conductivity.

Qb

Actual blood flow during on-line clearance. Taken when pre and post conductivity is at upper and lower point of conductivity.

Qf

Actual UF rate during on-line clearance. Taken when pre and post conductivity is at upper and lower point of conductivity.

QdI

Actual dialysate flow currently.

QdS

Is dialysate flow stable. 1 = Yes / 0 = No.

QbS

Blood flow stability. Must be below 10 to run on-line clearance / 0 is stable.

AF1

First access flow result.

AF2

Second access flow result.

AF3

Third access flow result.

0_test

Results from 0 on-line clearance test. Less than 25 is needed for the test to pass.

Current_TI

Temperature stability index value.

Example: X180 sec = [T180 – avg(T1:T180)]2

Avg_TI

= 110 – X, averaged over the last 12 minutes.

Example: Index is limited to 0 – 100

Pre Dev val

How much the pre-conductivity has deviated from the previous value. The closer to 0 the least amount of deviation. Sum of the squares – square of the sums over the last 31 counts.

Pre Stbl Ct

Counter that decrements to 0 when the pre deviation value is less that the allowed limit.

Pre % Stbl

Percent of time over the last 12 minutes that the pre conductivity stability value has been less than the limit (135).

Post Dev val

How much the post-conductivity has deviated from the previous value. The closer to 0 the least amount of deviation. Sum of the squares – square of the sums over the last 31 counts.

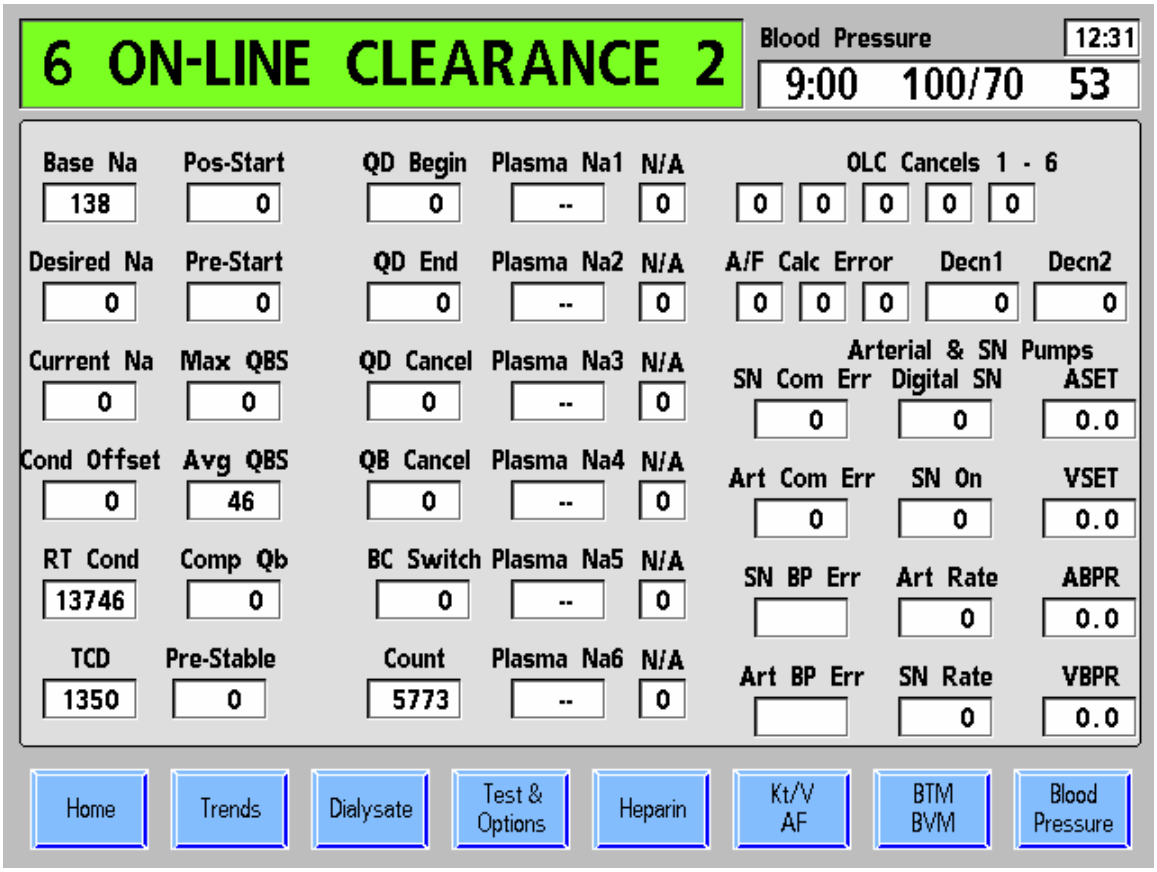
Post Stbl Ct

Counter that decrements to 0 when the pre deviation value is less that the allowed limit.

Post % Stbl

Percent of time over the last 12 minutes that the post conductivity stability value has been less than the limit (70).

DEBUG SCREEN 6 - ON-LINE CLEARANCE 2



BaseNa
Selected BaseNa.

Desired Na
Na level that the machine is trying to achieve.

Current Na
Na level that the machine is actually running at.

Cond Offset
Calculated offset for conductivity from the TCD.

RT Cond
Real Conductivity.

TCD
Theoretical conductivity for the concentrate type at the selected Na and bicarbonate.

Pos-Start
Post conductivity at the start of an OLC test.

Pre-Start
Pre conductivity at the start of an OLC test.

Max QBS
Maximum Qbs value during an OLC test.

Avg QBS
Average Qb DAC value.

Comp Qb
Arterial pressure compensated blood flow rate.

Pre Stable
A bit that shows if the pre conductivity is stable or not.
1 = Stable
0 = Not Stable

QD Begin
Dialysate flow rate at the beginning of the OLC test.

QD End
Dialysate flow rate at the end of the OLC test.

QD Cancel
Dialysate flow rate when the OLC test is cancelled.

QB Cancel
Blood flow rate when the OLC test is cancelled.

BC Switch
Balancing chamber switching time.
Example: 3.57 seconds = 357

Count
Counter for the delay of OLC steps calculation.

Plasma Na1
Plasma Na at beginning of treatment.

Plasma Na2
Plasma Na at second OLC test.

Plasma Na3
Plasma Na at third OLC test.

Plasma Na4
Plasma Na at fourth OLC test.

Plasma Na5

Plasma Na at fifth OLC test.

Plasma Na6

Plasma Na at sixth OLC test.

N/A (next to Plasma Na, 6 places)

0 = OLC test not yet done or Plasma Na calculated
1 = OLC test result = 0
2 = Pre conductivity not stable (before first test or after subsequent tests).
3 = Post conductivity not stable (before first test or after subsequent tests).
4 = Plasma Na > 170
5 = Plasma Na < 100
6 = RTD not counting down

OLC Test Cancel reasons (six total)

0 = No cancellation
1 = Time out at upper step
2= Time out at lower step
3 = QbS > 20 when blood sensed
4 = Dialysate flow unstable (3/10 balance chamber times >10% from average value).
5 = OLC disabled
6 = Dialysate flow stopped
7 = Test program start

Access Flow Calculation Errors (three total) ;

Note Decn is the Kecn1 recalculated at the same Qb and Qd as the second OLC test for AF.

0 - No error
1 - Kecn1 = 0
2 - Qd = 0
3 - Qb = 0
4 - Special case that would cause an illegal divide by zero:
0.85*Qb = Qd
5 - Special case that would cause an illegal divide by zero:
0.85*Qb = Kecn
6 - Special case that would cause an illegal divide by zero:
(exp[(1 – Qb/Qd)* KoA/Qb] – Qb/Qd) = 0
7 - Decn1 = 0
8 - Special case that would cause an illegal divide by zero:
Decn1 = Kecn2

Decn1 & Decn2

The first OLC test is recalculated at the same Qb & Qd as the second OLC test for Access Flow.

These are the recalculated Kecn1 values (Decn1) from Access Flow test 1 and 2.

ARTERIAL & SN PUMPS

SN Com Err

Single Needle Comm Error State:

1 = Error is Present
2 = Error is Reset
0 = No Error

Art Com Err

Arterial Blood Pump Communication Error State:

1 = Error is Present
2 = Error is Reset
0 = No Error

SN BP Err

Error number reported from single needle blood pump.

Example: A.16.

Art BP Err

Error number reported from Arterial blood pump.

Example: A.16

Digital SN

1 if Digital SN Blood pump is selected in service mode. 0 is it is not.

SN On

1 If the SN Blood Pump is on. 0 is it is not.

Art Rate

Arterial blood pump rate sent from the arterial blood pump to the functional board.

SN Rate

Single needle blood pump rate sent from the functional board to the single needle blood pump.

ASET

Arterial blood pump set (in Vdc). Sensor board input pin A12. Sensor board ADC input channel 10.

VSET

Venous (single needle) blood pump set (in Vdc). Sensor board input pin A11. Sensor board ADC input channel 11.

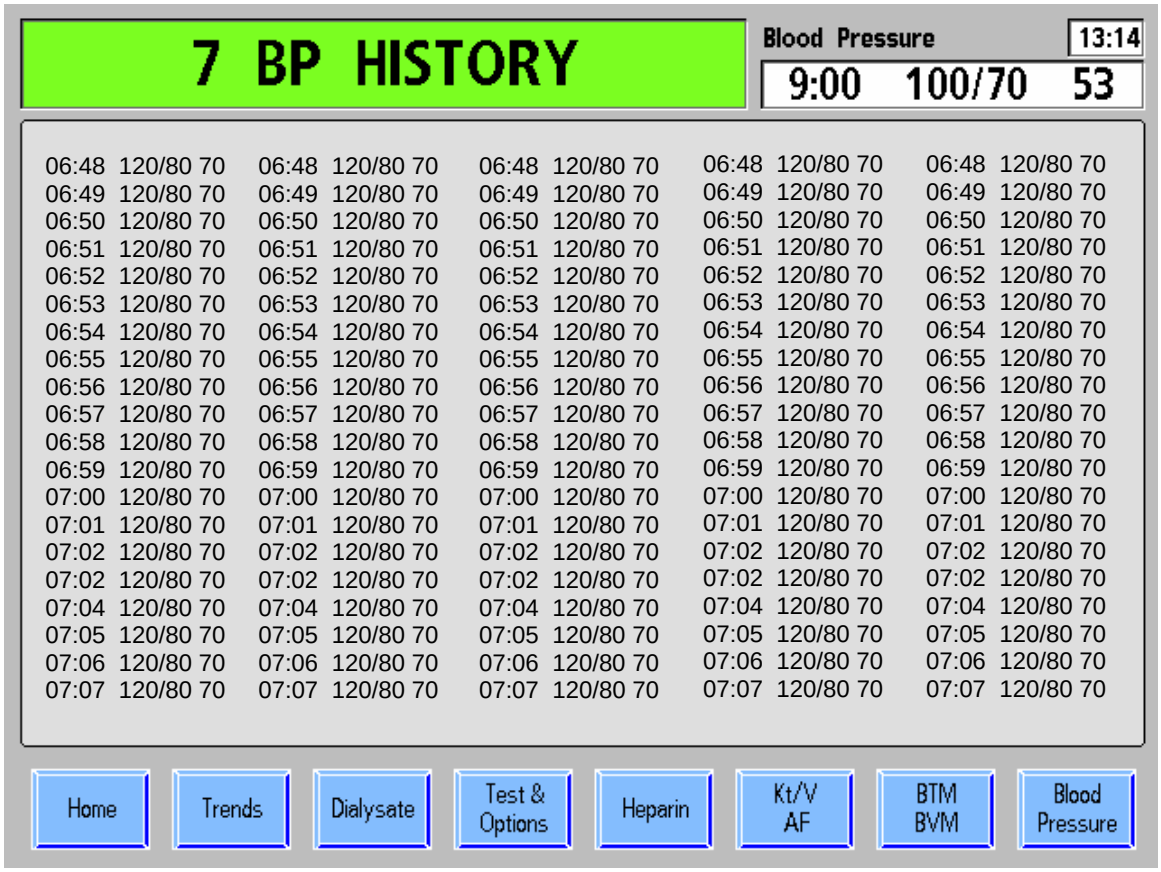
ABPR

Arterial Blood Pump Rate voltage from the sensor board.

VBPR

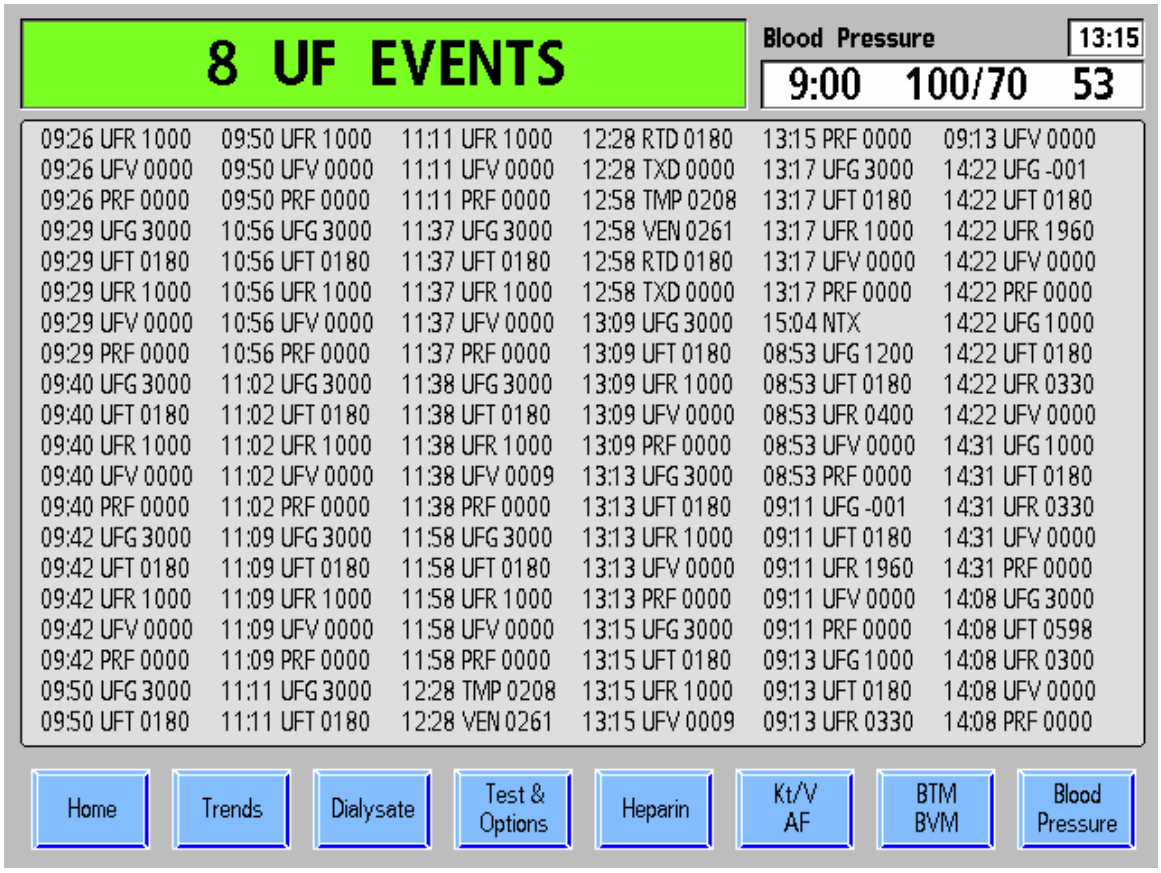
Venous (SN) Blood Pump Rate voltage from the sensor board.

DEBUG SCREEN 7 - BP HISTORY



- Time stamp
- Systolic
- Diastolic
- Pulse
- The oldest reading is at the top left, the newest at the bottom right
- The newest reading pushes the oldest reading off the end of the table
- The data is stored in battery ram, and is erased when replaced by a new reading
- When any of the Blood Pressure module tests are finished and confirmed, this table is initialized

DEBUG SCREEN 8 - UF HISTORY



This information is to be stored in battery RAM

120 events are to be recorded. The oldest event is replaced by the latest event when 120 events have been accumulated.

Events to be recorded / Including time stamp:

- UFG - Displays a new UF Goal value whenever it changes.
  Example: 12:00 UFG 4000
- UFT - Displays a new UF Time value whenever it changes
  Example: 12:00 UFT 180
- UFR - Displays a new UF Rate value whenever it changes.
  Example: 12:30 UFR 1600
- UF - Displays a new UF Volume value whenever it changes.
  Example: 12:00 UF 570

- PRF - Displays a new UF Profile number whenever it changes.
  Example: 12:00 PRF 0002

- AUF - Displays an Average UF Rate at the beginning if a UF profile is active and at each profile segment change.
  Example: 12:30 AUF 1500

- CUG - Displays a Calculated UF Goal at the beginning if a UF profile is active and at each profile segment change.
  Example: 12:30 CUG 5000

- TXD - Displays the Tx Clock, every 30 minutes when the Tx Clock is running.
  Example: 12:51 TXD 0180

- RTD - Displays the Remaining Time of Dialysis every 30 minutes when the Tx Clock is running.
  Example: 12:51 RTD 0120

- TMP - Displays the TMP value every 30 minutes when the Tx Clock is running.
  Example: 12:30 TMP 120

- VEN - Displays the Venous pressure value every 30 minutes when the Tx Clock is running.
  Example: 12:30 VEN 200

- TMA - Displays a TMP alarm whenever it occurs and value.
  Example: 12:30 TMA 120

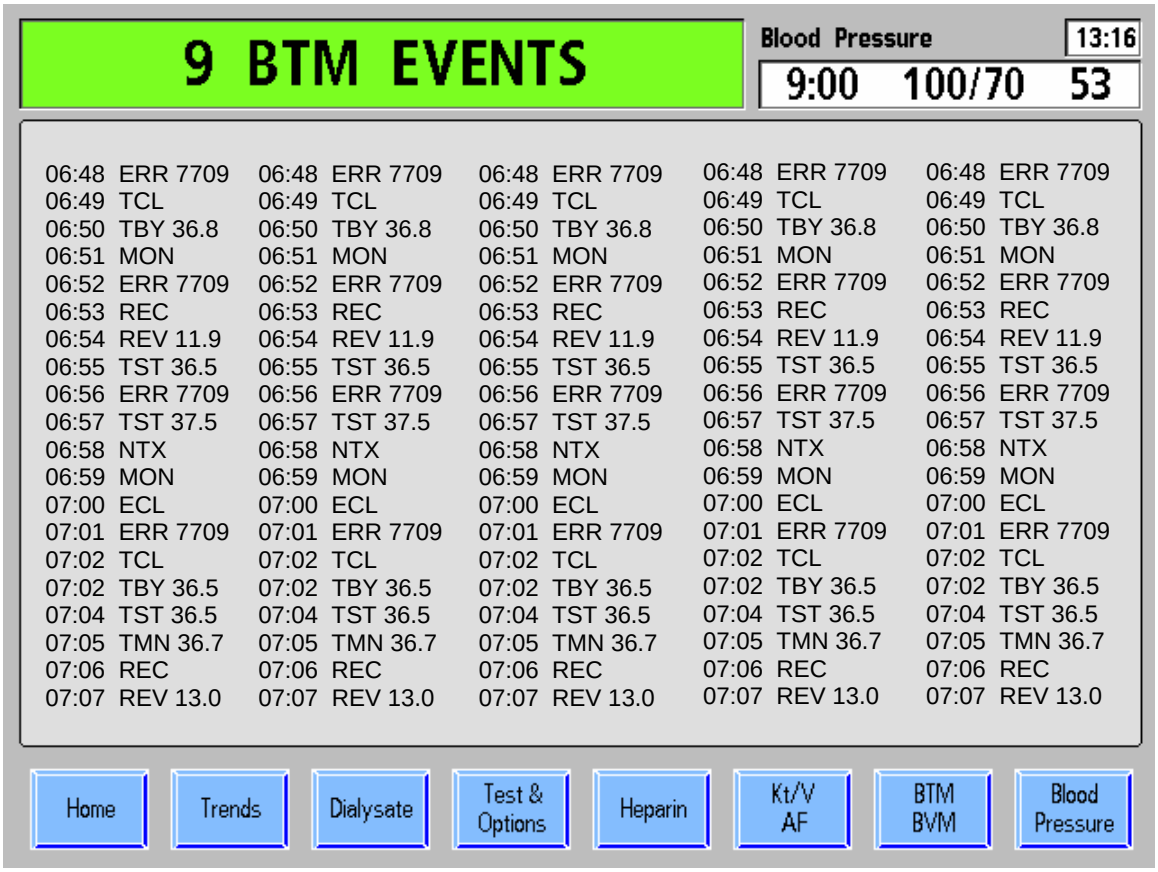
- PHT - Displays online PHT results whenever the test is run (two results are shown, one for each half of the balancing chamber)
  Example: 12:45 PHT 00 10

- UFE - Displays any UF Error along with the calculated UF Goal.
  Example: 12:45 UFE 4500

- FIL - Displays each occurrence of a Fill program.
  Example: 12:50 FIL

- NTX - Displays whenever the new Tx key is pressed.
  Example: 12:50 NTX

DEBUG SCREEN 9 - BTM EVENTS



This screen will have a list of recent BTM events.

120 events are to be recorded. The oldest event is replaced by the latest event when 120 events have been accumulated.

Events to be recorded (including time stamp):

- MON - Displays whenever the BTM mode changes to Monitoring.
  Example: 12:00 MON

- TCL - Displays whenever the BTM mode changes to Temperature Control.
  Example: 12:00 TCL

- TST - Every time the BTM changes the machine's temperature setting by 0.2 or more from the last recorded value, the new temperature setting is recorded. Also record every 15 minutes.
  Example: 12:00 TST 37.0

- TBY - Every time that a recirculation measurement is made and every time TST is displayed, the body temperature is recorded.
  Example: 12:00 TBY 36.50

- ECL - Displays whenever the BTM mode changes to Energy Mode.
  Example: 12:00 ECL

- EGY - Display Energy Flux during energy mode at initiation and with each change.
  Example: 12:00 EGY 1000

- REC - Displays whenever the BTM mode changes to Recirculation Mode.
  Example: 12:00 12:30 REC

- REV - Displays the recirculation value every time that a Recirculation Measurement is available.
  Example: 12:00 REV 11.7

- TMN - Displays temperature on monitor every 15 minutes.
  Example: 12:45 TMN 37.5

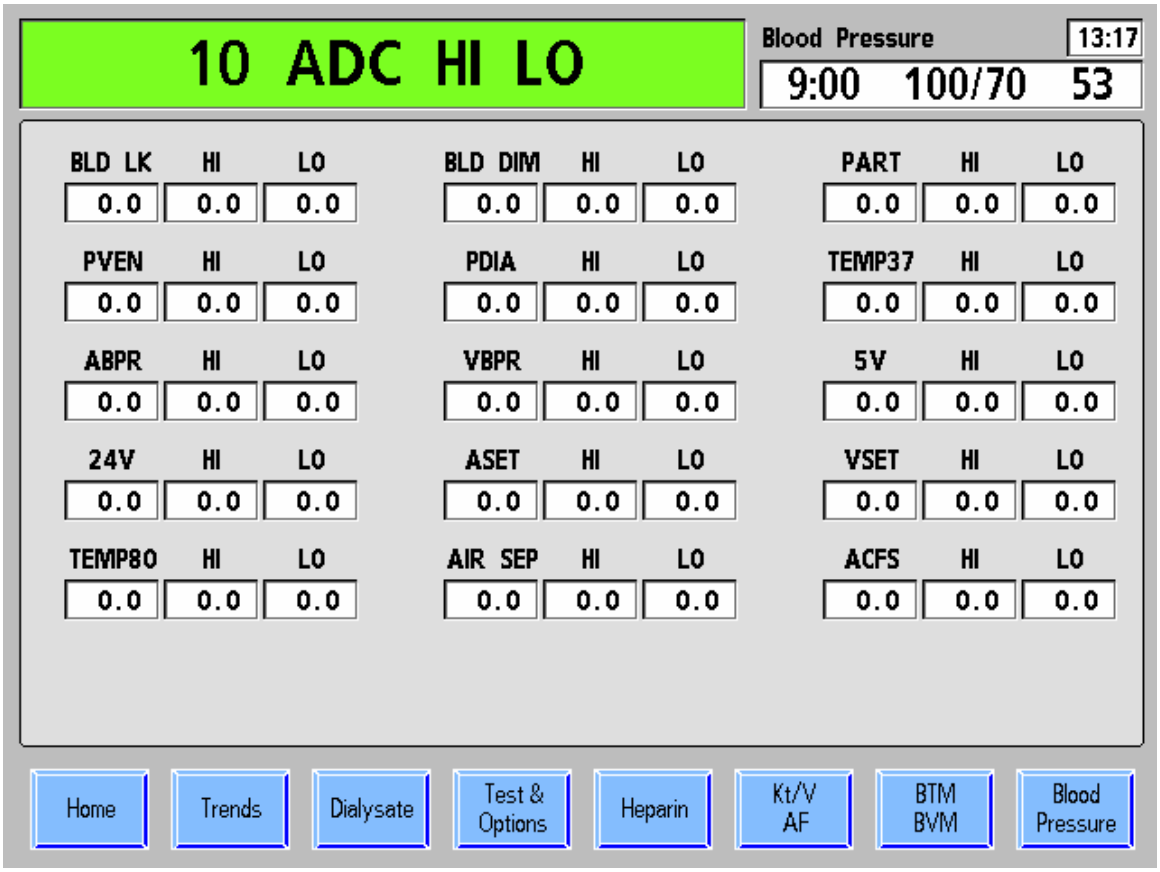
- QD - Displays the Dialysate Flow every time it changes.
  Example: 12:45 QD 800

- QB - Displays the Blood Flow every time Qd is displayed and each time REV is displayed.
  Example: 12:45 QB 300

- ERR - Displays an error with the error code every time an error occurs.
  Example: 12:00 ERR 1107

- NTX - Displays whenever the new Tx key is pressed.
  Example: 12:50 NTX

DEBUG SCREEN 10 - ADC HI LO



BLD LK

Blood leak voltage from the sensor board

HI = Record the highest blood leak voltage achieved
Start recording approximately 1 minute after power up

LO = Record the lowest blood leak voltage achieved
Start recording approximately 1 minute after power up

PVEN

Venous pressure voltage from the sensor board

HI = Record the highest venous pressure voltage achieved
Start recording approximately 1 minute after power up

LO = Record the lowest venous pressure voltage achieved
Start recording approximately 1 minute after power up

ABPR

Arterial blood pump rate voltage from the sensor board

HI = Record the highest arterial blood pump rate voltage achieved
Start recording approximately 1 minute after power up

LO = Record the lowest arterial blood pump rate voltage achieved
Start recording approximately 1 minute after power up

24V

24 volts from the sensor board

HI = Record the highest 24 volts achieved
Start recording approximately 1 minute after power up

LO = Record the lowest 24 volts achieved
Start recording approximately 1 minute after power up

TEMP80

80°C temperature channel voltage from the sensor board

HI = Record the highest 80°C temperature channel voltage achieved
Start recording approximately 1 minute after power up

LO = Record the lowest 80°C temperature channel voltage achieved
Start recording approximately 1 minute after power up

BLD DIM

Blood dimness voltage from the sensor board

HI = Record the highest blood dimness voltage achieved
Start recording approximately 1 minute after power up

LO = Record the lowest blood dimness voltage achieved
Start recording approximately 1 minute after power up

PDIA

Dialysate pressure transducer voltage from the sensor board

HI = Record the highest dialysate pressure transducer voltage achieved
Start recording approximately 1 minute after power up

LO = Record the lowest dialysate pressure transducer voltage achieved
Start recording approximately 1 minute after power up

VBPR

Venous blood pump rate voltage from the sensor board

HI = Record the highest venous blood pump rate voltage achieved
Start recording approximately 1 minute after power up

LO = Record the lowest venous blood pump rate voltage achieved
Start recording approximately 1 minute after power up

ASET

Arterial blood pump knob voltage from the sensor board

HI = Record the highest arterial blood pump knob voltage achieved
Start recording approximately 1 minute after power up

LO = Record the lowest arterial blood pump knob voltage achieved
Start recording approximately 1 minute after power up

AIR SEP

Air separation chamber sensors voltage from the sensor board

HI = Record the highest air separation chamber sensors voltage achieved
Start recording approximately 1 minute after power up

LO = Record the lowest air separation chamber sensors voltage achieved
Start recording approximately 1 minute after power up

PART

Arterial pressure voltage from the sensor board

HI = Record the highest arterial pressure voltage achieved
Start recording approximately 1 minute after power up

LO = Record the lowest arterial pressure voltage achieved
Start recording approximately 1 minute after power up

TEMP37

37°C temperature channel voltage from the sensor board

HI = Record the highest 37°C temperature channel voltage achieved
Start recording approximately 1 minute after power up

LO = Record the lowest 37°C temperature channel voltage achieved
Start recording approximately 1 minute after power up

5V

V5 volts from the sensor board

HI = Record the highest 5 volts achieved
Start recording approximately 1 minute after power up

LO = Record the lowest 5 volts achieved
Start recording approximately 1 minute after power up

VSET

Venous blood pump knob voltage from the sensor board

HI = Record the highest venous blood pump knob voltage achieved
Start recording approximately 1 minute after power up

LO = Record the lowest venous blood pump knob voltage achieved
Start recording approximately 1 minute after power up

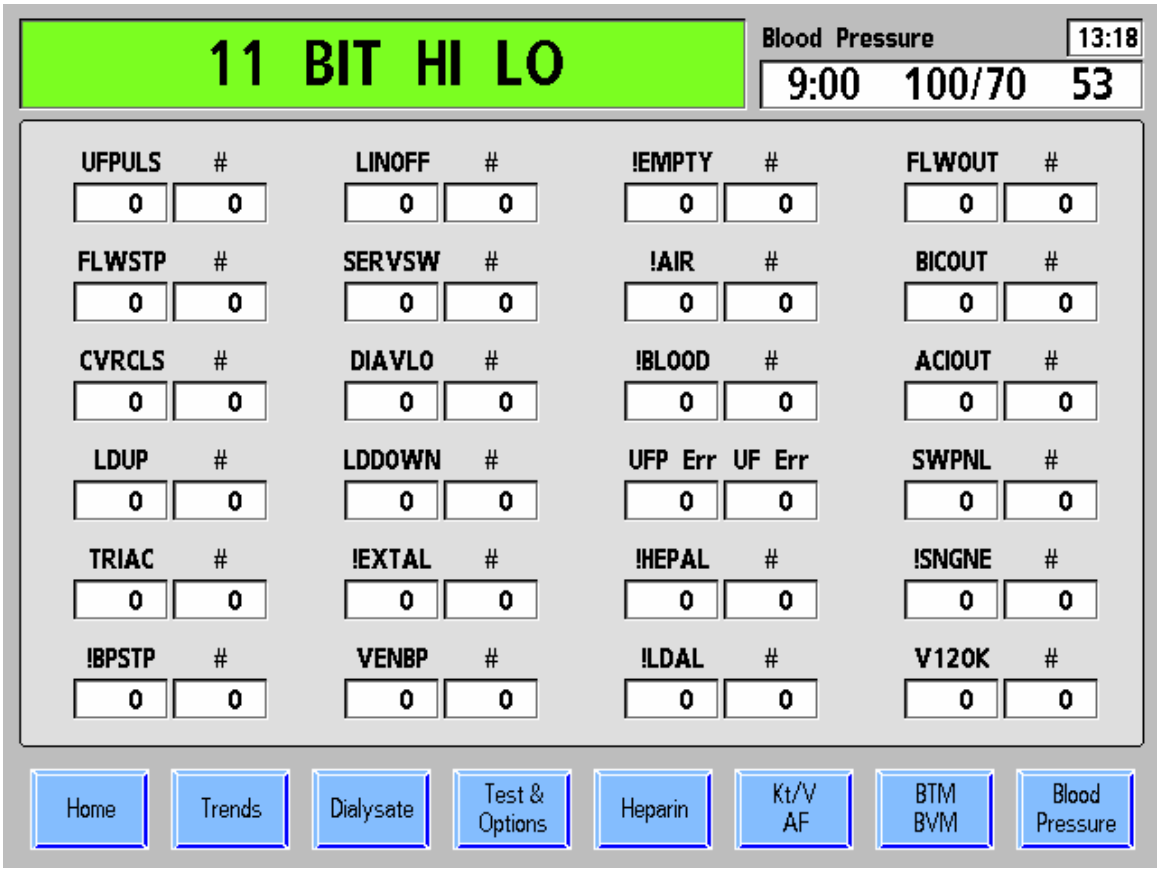
ACFS

Chamber full switch voltage from the actuator board

HI = Record the highest chamber full switch voltage achieved
Start recording approximately 1 minute after power up

LO = Record the lowest chamber full switch voltage achieved
Start recording approximately 1 minute after power up

DEBUG SCREEN 11 - BIT HI LO



UFPULS / #

UFPULS = UF pulse signal
Start recording approximately 1 minute after power up FLWSTP

= Record the number of times the UF pulse signal changes
Start recording approximately 1 minute after power up FLWSTP

FLWSTP / #

FLWSTP = Flow stop signal
Start recording approximately 1 minute after power up

= Record the number of times the flow stop signal changes
Start recording approximately 1 minute after power up

CVRCLS / #

CVRCLS = Shunt cover closed signal
Start recording approximately 1 minute after power up

= Record the number of times the shunt cover closed signal changes
Start recording approximately 1 minute after power up

LDUP / #

LDUP = Level adjust up signal
Start recording approximately 1 minute after power up

= Record the number of times the level adjust up signal changes
Start recording approximately 1 minute after power up

TRIAC / #

TRIAC = Triac signal
Start recording approximately 1 minute after power up

= Record the number of times the triac signal changes
Start recording approximately 1 minute after power up

!BPSTP / #

!BPSTP = Blood pump stopped signal
Start recording approximately 1 minute after power up

= Record the number of times the blood pump stopped signal changes
Start recording approximately 1 minute after power up

LINOFF / #

LINOFF = Lines off the shunt signal
Start recording approximately 1 minute after power up

= Record the number of times the lines off the shunt signal changes
Start recording approximately 1 minute after power up

SERVSW / #

SERVSW = Service switch signal
Start recording approximately 1 minute after power up

= Record the number of times the service switch signal changes
Start recording approximately 1 minute after power up

DIAVLO / #

DIAVLO = Dialysis valve open signal
Start recording approximately 1 minute after power up

= Record the number of times the dialysis valve open signal changes
Start recording approximately 1 minute after power up

LDDOWN / #

LDDOWN = Not Used

= Not Used

!EXTAL / #

!EXTAL = No external alarm signal
Start recording approximately 1 minute after power up

= Record the number of times the no external alarm signal changes
Start recording approximately 1 minute after power up

VENBP / #

VENBP = Venous blood pump connected signal
Start recording approximately 1 minute after power up

= Record the number of times the venous blood pump connected signal changes
Start recording approximately 1 minute after power up

!EMPTY / #

!EMPTY = Not emptying signal
Start recording approximately 1 minute after power up

= Record the number of times the not emptying signal changes
Start recording approximately 1 minute after power up

!AIR / #

!AIR = No air sensed signal
Start recording approximately 1 minute after power up

= Record the number of times the no air sensed signal changes
Start recording approximately 1 minute after power up

!BLOOD / #

!BLOOD = No blood sensed signal
Start recording approximately 1 minute after power up

= Record the number of times the no blood sensed signal changes
Start recording approximately 1 minute after power up

!SWITC / #

!SWITC = Not power switch active signal
Start recording approximately 1 minute after power up

= Record the number of times the not power switch active signal changes
Start recording approximately 1 minute after power up

!HEPAL / #

!HEPAL = No heparin pump alarm signal
Start recording approximately 1 minute after power up

= Record the number of times the no heparin pump alarm signal changes
Start recording approximately 1 minute after power up

!LDAL / #

!LDAL = No level detector alarm signal
Start recording approximately 1 minute after power up

= Record the number of times the no level detector alarm signal changes
Start recording approximately 1 minute after power up

FLWOUT / #

FLWOUT = Flow out signal
Start recording approximately 1 minute after power up

= Record the number of times the flow out signal changes
Start recording approximately 1 minute after power up

BICOUT / #

BICOUT = Bicarb wand out signal
Start recording approximately 1 minute after power up

= Record the number of times the bicarb wand out signal changes
Start recording approximately 1 minute after power up

ACIOUT / #

ACIOUT = Acid wand out signal
Start recording approximately 1 minute after power up

= Record the number of times the acid wand out signal changes
Start recording approximately 1 minute after power up

SWPNL / #

SWPNL = Power switch activated signal
Start recording approximately 1 minute after power up

= Record the number of times the power switch activated signal changes
Start recording approximately 1 minute after power up

!SNGNE / #

!SNGNE = No single needle signal
Start recording approximately 1 minute after power up

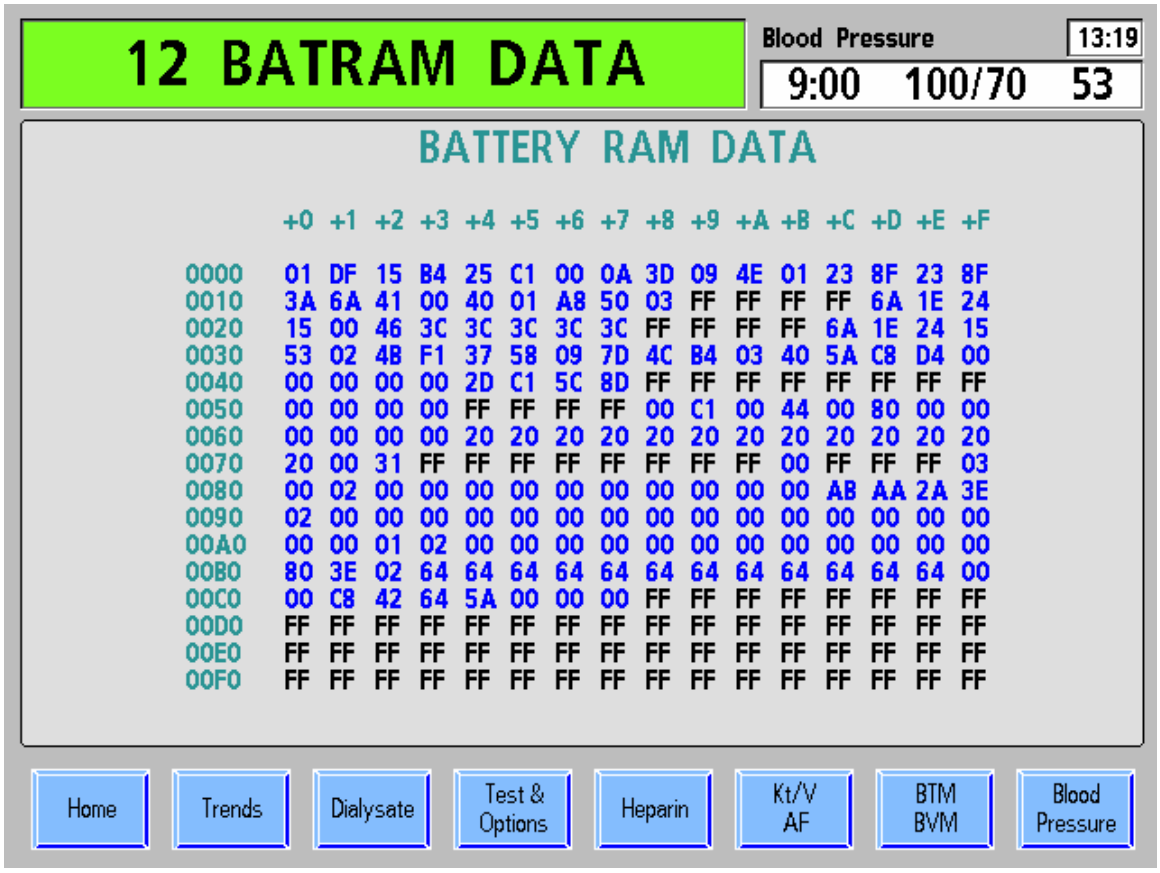
= Record the number of times the no single needle signal changes.
Start recording approximately 1 minute after power up

V12OK / #

V12OK = 12 volts OK signal
Start recording approximately 1 minute after power up

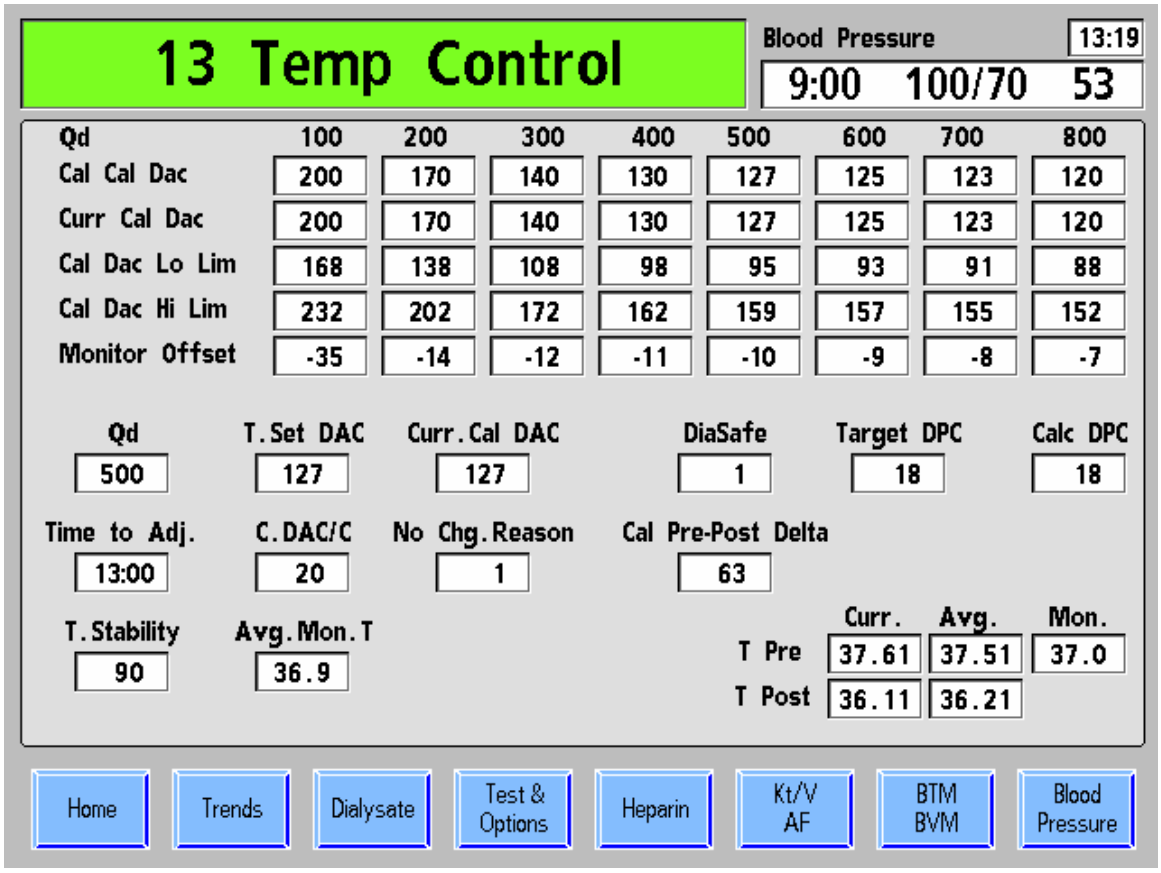
= Record the number of times the 12 volts OK signal changes
Start recording approximately 1 minute after power up

DEBUG SCREEN 12 - BATRAM DATA



Note: This screen is use for software development only.

DEBUG SCREEN 13 - TEMP CONTROL



Note: Values on this screen are only valid for machines with Online Clearance (OLC) and the Temperature Compensation (Temp Comp.) hardware option enabled.

Cal Cal DAC

The Cal-DAC values for the various dialysate flow rates when the machine was calibrated.

Curr Cal DAC

The current adjusted Cal-DAC values for the various dialysate flow rates. These will be the defaults for when the Qd flow rate is changed. This table is updated whenever a new Cal-DAC value is used.

Cal DAC Lo limit

The lowest allowed Cal-DAC values for the various dialysate flow rates.

Cal DAC Hi limit

The highest allowed Cal-DAC values for the various dialysate flow rates.

Monitor Offset

The difference between the offset of NTC3 and the dialyzer temperature at 500 (or 100) for the various dialysate flow rates.

Qd

Current dialysate flow rate, ml/min.

Time to Adj.

The time (min:sec) until the next time a new Cal-DAC value will be calculated.

T.Stability

The temperature stability value:

- Note: T is the average temperature sample over 2 seconds
- X180 = ((Avg (T1 to T180)) - (Avg (T121 to T180)))2
- Tiinst180 = 110 – X180 (Limit to 0 - 100)
- Tiavg210 = Avg (Tiinst 181 to Tiinst210)

T.Set DAC

The temperature set DAC value:

C.DAC/C

The calibration DAC change necessary to get a 1°C change in monitor temperature at Qd 500:

Avg.Mon.T

This is the average monitor temperature (6 min avg.)

Curr.Cal DAC

The is the Cal DAC being used by the machine (same as the table value for the current Qd).

No Chg.Reason

The reason that the Cal-DAC was not adjusted at the last opportunity.

0- Monitor temp at 37, no change necessary or adjusted at the last opportunity.
Message: Not necessary

1- Not yet time for first adjustment after startup.
Message: Too early

2- Temp Stability not > 70.
Message: Temp Stability < 70

3- Dialysate flow rate change delayed adjustment.
Message: Qd adjusted

4- Fill Program delayed adjustment.
Message: Fill program

5- Heater off condition delayed adjustment.
Message: Heater off condition

6- Cal-DAC is at lower limit of allowed adjustment.
Message: Cal-DAC at low limit

7- Cal-DAC is at upper limit of allowed adjustment.
Message: Cal-DAC at high limit

DiaSafe

The setting for the DiaSafe option.

Cal Pre-Post Delta

The difference between the Pre and Post temperature sensors at 500 ml/min when the machine is in bypass (during a calibration step).

Target DPC

This is the target DAC counts per degree C. This is shown only during the test.

Calc DPC

This is the calculated DAC counts per degree C determined by the test.
Temp Control - Continued

T Pre

Curr. = The current NTC3 (pre) or NTC4 (post) reading (2 sec avg.)
Avg. = The current NTC3 (pre) or NTC4 (post) average reading (6 min. avg.)
Mon. = The current monitor reading (NTC3 + monitor offset)

T Post

Curr. = The current NTC3 (pre) or NTC4 (post) reading (2 sec avg.)
Avg. = The current NTC3 (pre) or NTC4 (post) average reading (6 min. avg.)